



# Draft Environmental Impact Statement for the Haile Gold Mine Project



**SAC 1992-24122-4IA**  
March 2014

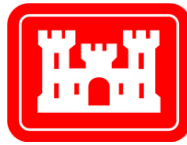


U.S. Army Corps of Engineers  
Charleston District

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## COVER SHEET

### Draft Environmental Impact Statement Haile Gold Mine Project Lancaster County, South Carolina

**LEAD AGENCY:**

Department of the Army  
U.S. Army Corps of Engineers, Charleston District

**COOPERATING AGENCIES:**

U.S. Environmental Protection Agency  
South Carolina Department of Health and Environmental  
Control  
Catawba Indian Nation

**ABSTRACT:**

The U.S. Army Corps of Engineers Charleston District (USACE) is examining the potential impacts of the proposed Haile Gold Mine, located in Lancaster County in north-central South Carolina. The proposed open-pit mining and associated ore processing facilities would produce gold for sale. Active mining would take place over an approximately 12-year period, and mine closure and monitoring activities would extend for many years thereafter. Haile Gold Mine, Inc. (Haile or the Applicant), a subsidiary of Romarco Minerals, Inc. has applied for a Department of the Army (DA) permit from the USACE to allow discharge of dredged or fill material into Waters of the United States pursuant to Section 404 of the Clean Water Act (CWA) during the mining process. The Project involves a federal action because the fill activities associated with gold mining in wetlands and other Waters of the United States require authorization through a DA permit under Section 404 of the CWA (33 U.S. Code [USC] 1344). The USACE serves as the lead agency for jurisdictional determinations and permit actions, and has set forth implementing regulations in Title 33 Code of Federal Regulations (CFR) Parts 320–332.

This Draft Environmental Impact Statement (Draft EIS) has been prepared pursuant to (1) Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq.); (2) the Council on Environmental Quality regulations for implementing the procedural provisions of NEPA (40 CFR 1500-1508); (3) Section 404 of the CWA on permitting disposal sites for dredged or fill material (33 USC 1344), as amended; and (4) USACE regulations found at 33 CFR 320–332, including Appendix B, *NEPA Implementation Procedures for the Regulatory Program*.

The USACE has determined that the overall Project purpose is to open and operate a gold mining operation using gold-bearing mineral reserves in the Carolina Slate Belt region. The stated need for the Project is to provide for increased domestic gold production to meet world demand.

The Draft EIS evaluates three alternatives, including the No Action Alternative. Potential direct, indirect, and cumulative impacts were evaluated for 18 resource areas that could be affected by the proposed Project.

All comments concerning this Draft EIS are requested to be submitted by **May 9, 2014**.

For further information or to submit comments, contact the U.S. Army Corps of Engineers, Charleston District:

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Or visit the Project website at [www.HaileGoldMineEIS.com](http://www.HaileGoldMineEIS.com).

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## SUMMARY OF CONTENTS

### Volume I: Draft Environmental Impact Statement

<b>Executive Summary</b>	The Executive Summary answers frequently asked questions about the Haile Gold Mine Project (the proposed Project). It describes the key elements of the proposed Project and the regulatory framework of the Environmental Impact Statement (EIS).
<b>Chapter 1 Project Background and Purpose and Need</b>	Chapter 1 describes the Project purpose and need, the mine development process, scope of the EIS, and agency roles and responsibilities. It provides a summary of the permits, licenses, and other approvals required for the Project and the steps the U.S. Army Corps of Engineers (USACE) will take to obtain comments from the public on this Draft EIS and to complete the Final EIS.
<b>Chapter 2 Project Description and Alternatives</b>	Chapter 2 summarizes the application for a Department of Army (DA) permit submitted by the Applicant (Haile Gold Mine, Inc.) and describes construction, operations, reclamation, closure, and long-term monitoring of the proposed gold mine. The development and consideration of a range of alternatives is presented, leading to the selection of alternatives carried through detailed analysis and alternatives considered but not evaluated in further detail in the EIS. A summary matrix compares the results of the environmental analysis of the Applicant's Proposed Project and the alternatives.
<b>Chapter 3 Affected Environment</b>	Chapter 3 describes the existing conditions and the regulatory setting for the 18 resources areas evaluated in the Draft EIS. The current conditions of these resources, projected out through the temporal scope of the analysis period, form the basis for the No Action Alternative (the likely future No Action condition) that is used as the baseline for comparison of the environmental consequences of the alternatives.
<b>Chapter 4 Environmental Consequences</b>	Chapter 4 provides a comprehensive analysis of potential environmental impacts on the 18 resource areas across alternatives, including the methods of analysis, impact summaries, and potential mitigation measures. The introduction to Chapter 4 describes the overall approach to the environmental analysis and topics. The introduction also discusses topics important to the environmental analysis, including the models used to evaluate impacts on surface water, groundwater, and other water-related resources; use and management of cyanide; financial assurances and bonding; and facility failure considerations.
<b>Chapter 5 Cumulative Impacts</b>	Chapter 5 addresses the potential cumulative impacts of the proposed Project and the alternatives when considering other past, present, and reasonably foreseeable future projects that are likely to occur within the same geographic and temporal scope.
<b>Chapter 6 Mitigation and Monitoring</b>	Chapter 6 addresses the compensatory mitigation required under the Clean Water Act for impacts on wetlands and other waters of the United States. The chapter identifies the Applicant's proposed avoidance and minimization measures and the additional mitigation measures being considered by the USACE. Monitoring and adaptive management also are discussed.
<b>Chapter 7 Other Considerations</b>	Chapter 7 considers the relationship between local short-term uses of man's environment and maintenance and enhancement of long-term productivity, the irretrievable and irreversible commitment of resources with implementation of the proposed Project, and the adverse environmental impacts that cannot be avoided if the proposed Project is implemented.
<b>Chapter 8 Consultation and Coordination</b>	Chapter 8 provides the full range of public, tribal, and agency involvement activities implemented to date (1) to ensure that the public understands the proposed Haile Gold Mine Project; and (2) to ensure that the public has ample opportunity to comment on all aspects of the proposed Project, to participate in the National Environmental Policy Act process, and to review the environmental analysis and proposed mitigation and monitoring.
<b>Chapter 9 List of Preparers</b>	This chapter identifies the USACE, cooperating agency, and third-party contractor staff who contributed materially to preparation of the Draft EIS.
<b>Glossary</b>	The glossary provides definitions for many of the terms used in the Draft EIS.

## **Volume II: Appendices**

- A Description of the Proposed Haile Gold Mine Project
- B Compensatory Mitigation Plan
- C Draft Clean Water Act Section 404(b)(1) Guidelines Evaluation
- D Haile Gold Mine EIS Scoping Report
- E Haile Gold Mine EIS Agency Correspondence
- F Laws, Policies, and Plans Applicable to the Haile Gold Mine Project
- G Monitoring and Management Plan (MMP)
- H Haile Gold Mine Reclamation Plan
- I Groundwater Modeling Report and Additional Groundwater Information
- J Supporting Information and Analysis for Surface Water Resources
- K Supporting Information and Analysis for Wetlands and Other Waters of the United States
- L Supporting Information and Analysis for Aquatic Resources
- M Supporting Information and Analysis for Cultural Resources
- N Supporting Information and Analysis for Visual Resources Assessment
- O Supporting Information for Cumulative Impacts Assessment



## EXECUTIVE SUMMARY

Haile Gold Mine, Inc. (Haile, the Applicant) has applied to the U.S. Army Corps of Engineers (USACE) for a Department of the Army (DA) permit to impact waters of the United States<sup>1</sup> (including wetlands and streams) associated with construction and operation of a gold mine in South Carolina. As a federal agency, the USACE is required to comply with the National Environmental Policy Act (NEPA) of 1969 which is the “basic national charter for the protection of the environment” (40 Code of Federal Regulations [CFR] 1500.1[a]) and requires that all “major federal actions affecting the quality of the human environment” must undergo a review process that culminates in a “detailed statement” of the environmental impact of the proposed action, of any adverse effects, and of alternatives to the proposed action (42 U.S. Code [USC] 4332 [C]). Based on preliminary information provided by the Applicant, the USACE determined that the proposed Haile Gold Mine would significantly affect the quality of the human and natural environment. The USACE also determined that issuing a DA permit would constitute a major federal action that must undergo a review process to analyze and disclose the environmental impacts of the proposed action, of any adverse effects, and of alternatives to the proposed action. On July 1, 2011, the USACE notified the Applicant that these determinations warranted preparation of an Environmental Impact Statement (EIS).

This Executive Summary describes the role of the EIS in the USACE’s decision-making process and the NEPA process. It summarizes the proposed Project, the potential Project-related impacts, alternatives to the proposed Project, and measures to minimize potential impacts. The Executive Summary also explains how public, federal, state, and local agencies with jurisdiction and cooperating Indian tribes participated in preparing the EIS by determining the investigative scope of the EIS, and by reviewing and commenting on the results.

### Question 1 – What is the purpose of this EIS?

The purpose of this EIS is to inform regulatory decision makers and the public of the environmental effects of the proposed Project.

#### **Further Information:**

The proposed Project involves the placement of dredge and fill material into Waters of the U.S. associated with construction and operation of a commercial gold mine. These actions require a DA permit pursuant to Section 404 of the Clean Water Act of 1972 (CWA). The USACE serves as the lead agency for jurisdictional determinations and permit actions associated with Waters of the U.S.; the USACE has set forth implementing regulations in 33 CFR Parts 320–332.

Based on preliminary information provided by the Applicant, the USACE determined that the proposed Haile Gold Mine has the potential to significantly affect the quality of the human and natural environment. The USACE also determined that issuing a DA permit with significant effects would constitute a major federal action that must undergo a review process culminating in a “detailed statement” of the environmental impact of the proposed action, of any adverse effects, and of alternatives to the proposed action (42 USC 4332 [C]). On July 1, 2011, the USACE notified the Applicant that these determinations warranted preparation of an EIS. This EIS has been prepared pursuant to (1) Section 102(2)(c) of NEPA (42 USC 4321 et seq.); (2) the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 CFR 1502.4 et seq.);

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<sup>1</sup> The definition of *waters of the United States* can be found at <http://water.epa.gov/lawsregs/guidance/wetlands/CWAwaters.cfm>.

(3) Section 404 of the CWA on permitting disposal sites for dredged or fill material (33 USC 1344), as amended; and (4) NEPA Implementing Procedures for the Regulatory Program (33 CFR 325, Appendix B).

An EIS is not a USACE regulatory decision document; it is used by the USACE and other agency officials in conjunction with additional relevant information in a permit application file, including public and agency comments presented in the Final EIS, to inform the final decision on a permit application. The EIS is prepared in cooperation with other regulatory agencies and tribes that have regulatory authority /or special expertise with respect to environmental issues. Cooperating agencies for this EIS include the Catawba Indian Nation, U.S. Environmental Protection Agency (USEPA), and the South Carolina Department of Health and Environmental Control (SCDHEC).

## **Question 2 – What is the Haile Gold Mine Project?**

Haile proposes to build and operate the Haile Gold Mine at an existing mine site. The Project consists of excavating mine pits, building a processing Mill and associated facilities, and processing the identified ore reserves to produce gold and lesser amounts of silver. The proposed Project is located in Lancaster County in north-central South Carolina, near Kershaw, South Carolina.

### **Further Information:**

The proposed Haile Gold Mine Project is located 3 miles northeast of the town of Kershaw in southern Lancaster County. The Project area includes a total of 4,552 acres, of which approximately 2,612 acres<sup>2</sup> would be used for Project features. Although the site was previously mined for gold and other materials, there is no active mining at present. The former mine site is currently undergoing post-closure monitoring activities associated with closure and reclamation of the former mine workings. The Project area has no other ongoing commercial, industrial, or urban uses.

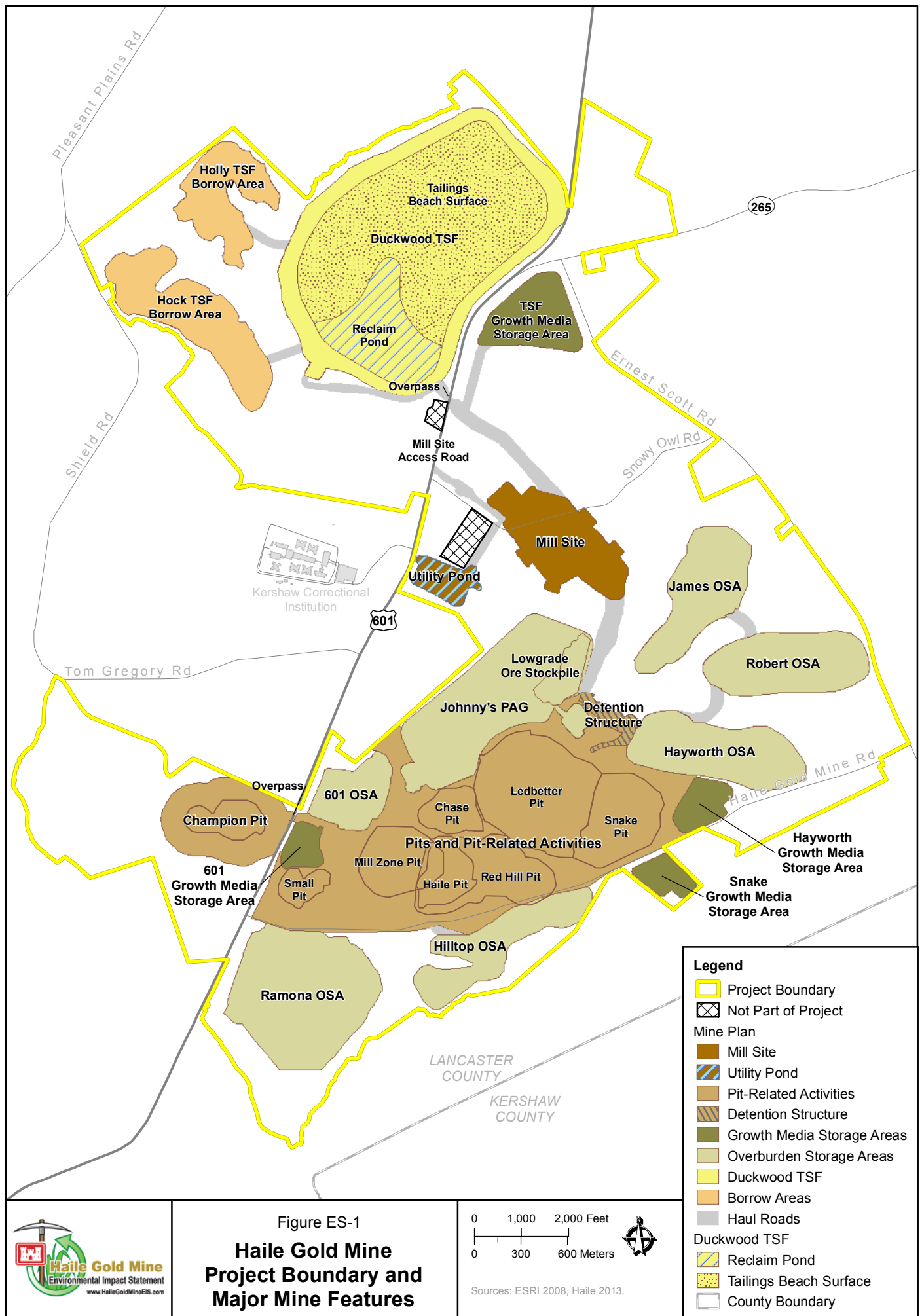
Project facilities would include mine pits where overburden and ore would be extracted, overburden storage areas (OSAs), growth media storage areas, a processing Mill with associated maintenance and administrative facilities to extract and refine gold, a tailings storage facility (TSF), water storage ponds, sediment detention ponds, a water treatment plant, roads, laydown areas, borrow areas for construction materials, and temporary construction areas (Figure ES-1).

The mining phase of the Project is estimated to last approximately 15 years. This includes 1 year of pre-production and construction, 12 years of active mining, and 2 years of continued ore processing after active mining is completed. The Haile Gold Mine EIS website at <http://www.hailegoldmineeis.com> includes information and graphics about the Project in addition to those provided in this EIS.

The EIS also considers connected actions that would be undertaken by others but are necessary for operation of the Project. These actions include installation of an electric transmission line from a point of interconnection with the regional electrical grid and a substation to be constructed on the mine site, and interconnection with natural gas, water, and sewer utilities. These connected actions are recognized as part of the EIS evaluation of impacts but are not part of the permit application under review by the USACE.

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<sup>2</sup> The area estimated for Project features does not include the area of a disturbance buffer around the design footprint of each mine component.



### Question 3 – What is the purpose of and need for the Project?

The USACE has determined that the overall purpose of the Haile Gold Mine Project is:

*To open and operate a gold mining operation using gold-bearing mineral reserves in the Carolina Slate Belt region.*

#### **Further Information:**

To effectively evaluate alternatives to the proposed Project with potentially less environmental impact, the USACE must make an independent determination of the “overall Project purpose.” Haile Gold Mine, Inc. is a commercial mining venture that has undertaken significant investigation of the mine site and vicinity to locate and quantify the extent of recoverable mineral reserves. They also have assessed the feasibility of the proposed Project using codified mining industry financial standards. Based on their assessment of the mineral reserves, Haile’s stated purpose for the project is:

*To produce gold for sale from the mineralized gold-bearing zones on the Haile property (Haile 2012a).*

While this stated purpose represents Haile’s commercial interest in the Project, USACE regulations require the USACE to independently determine the Project purpose and to evaluate the Applicant’s stated need to determine whether it is “unduly speculative.” Specifically, the USACE regulatory guidelines state:

*The overall project purpose should be specific enough to define the applicant’s needs, but not so restrictive as to constrain the range of alternatives that must be considered under the 404(b)(1) guidelines. However, the applicant’s needs, and the type of project being proposed, should be considered (40 CFR 230).*

Based on these guidelines, the USACE has determined that the overall Project purpose of the Haile Gold Mine is:

*To open and operate a gold mining operation using gold-bearing mineral reserves in the Carolina Slate Belt region.*

Gold is a highly valued commodity that has been historically mined within the Carolina Slate Belt region. Although the Applicant more narrowly defined the Project purpose to the mineralized gold-bearing zones on the Haile property, the USACE must evaluate a broader geographic range in its alternatives analysis under NEPA. Gold ore is known to occur throughout the Carolina Slate Belt in potentially mineable concentrations (USGS 2012). Therefore, the USACE determined that the Project purpose must consider alternative locations within the Carolina Slate Belt beyond the Haile property. The Applicant’s stated purpose and need for the Project was found not to be “unduly speculative” by the USACE because there is a demonstrated demand for gold and the Project is proposed within a gold-bearing region.

The CWA also requires the USACE to determine whether the Project, by its very nature, must be located in Waters of the U.S. such as wetlands or rivers and streams in order to fulfill its basic purpose (referred to as a *water-dependent* project). Because the Project does not require access, proximity to, or siting within Waters of the U.S. to open and operate a gold mining operation using gold-bearing mineral reserves in the Carolina Slate Belt region, the USACE has found that the Project is not water dependent. Therefore, practical alternatives that do not involve discharges to Waters of the U.S. are presumed to be available unless the Applicant can clearly demonstrate otherwise.

## Question 4 – What alternatives to the proposed Project were considered and how were they identified?

A rigorous alternatives analysis was undertaken to identify reasonable and practicable alternatives to the proposed Project. The outcome of this analysis identified three alternatives that are evaluated in detail in the Draft EIS:

- No Action Alternative – denial of the DA permit for fill of streams and wetlands. The post-closure monitoring activities currently underway at the site would continue to their conclusion.
- Applicant’s Proposed Project – the revised Project configuration proposed by Haile.
- Modified Project Alternative – the revised configuration for the Ramona OSA and use of the borrow areas adjacent to the TSF for overburden storage.

### Further Information:

NEPA regulations consider the alternatives analysis to be the “heart of the Environmental Impact Statement” (40 CFR 1502.14). NEPA requires that federal agencies reasonably explore and objectively evaluate all *reasonable* alternatives, including the No Action Alternative. The USACE also must evaluate *practicable* alternatives as required by Section 404 of the CWA (33 CFR 325, Appendix B, Paragraph 9[b][5]). Because the USACE is a regulatory agency and not the entity constructing the activity, decision options or alternatives available to the District Engineer include (1) issuing the permit; (2) issuing the permit with modifications or conditions; or (3) denying the permit. Only reasonable<sup>3</sup> alternatives must be considered in detail. The alternatives analysis must be thorough enough to use for both the public interest review and the 404(b)(1) guidelines. The No Action Alternative would mean that the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity. The analysis of the No Action Alternative provides a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives (CEQ Memorandum “Forty Most Asked Questions Concerning CEQ’s Nation Environmental Policy Act Regulations”).

Under Section 404 of the CWA, the USACE must make a specific finding when issuing a DA permit that there is no practicable alternative to the proposed project that would cause less impact on Waters of the U.S. The term *practicable* means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose.

Alternative sites, configurations, and technologies were identified from reports submitted by Haile in support of the application for a DA permit and in comments received during the EIS scoping process from members of the public, other interested governmental agencies and groups, and Native American tribes with interests in the Project area. The USACE reviewed and evaluated the alternatives considered by Haile and those suggested by the public, tribes, and agencies to determine whether any were reasonable and should then be evaluated at the same level of detail in the Draft EIS as the proposed Project (40 CFR 1502.14[a]). In addition to being technically and economically feasible, *reasonable* also means an alternative that would satisfy the primary objectives of the project defined in the Applicant’s statement of project purpose. The regulations further require that the USACE alternatives analysis identify the least environmentally damaging practicable alternative (LEDPA).

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<sup>3</sup> CEQ’s Forty Questions (<http://ceq.hss.doe.gov/nepa/regs/40/40p3.htm>) adds that “Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant.”

Separately, the USACE completed a systematic evaluation of potential alternatives to the proposed Project, beginning with the Project location and proceeding through each of the major Project elements. The major Project elements evaluated by the USACE shown in Table ES-1 were the structure for the evaluation.

**Table ES-1 Major Project Elements Considered in the USACE Alternatives Analysis**

Project Element	Alternatives Considered
Mine locations	Mining gold deposits at other locations in the Carolina Slate Belt
Mining methods	Using methods other than open-pit mining to extract gold-bearing ore
Ore processing methods	Using methods other than the proposed milling and carbon-in-leach method
Mill sites	Locating the Mill at an alternative site
Overburden storage areas	Designing alternative locations and configurations for overburden storage
Tailings storage facilities	Locating tailings storage facilities at alternative sites or using different configurations for long-term tailings storage
Water management	Providing for alternative water supplies and water management systems
Roads	Routing and configuring access and haul roads at different locations within the mine site
Transmission lines	Routing transmission interconnections to the mine to a different alignment
Mine operating plans	Developing a different scheme and schedules for mine development, operations, and reclamation

Alternative mine locations were considered, but no alternative locations were identified with the required feasibility study to establish mineral reserves.<sup>4</sup> Underground mining versus open-pit excavation was evaluated, as were alternative ore processing methods. Alternate locations of the Mill, OSAs, TSF, and storage areas for potentially acid-generating (PAG) wastes within the Project boundary were evaluated. Material storage (overburden, tailings, and PAG material) also was reviewed to determine whether alternative design criteria, such as different slope angles, would result in a smaller Project footprint and less impact on Waters of the U.S. With one exception, the alternatives identified and considered were found not to reduce impacts, were not practicable, or did not meet the Applicant's purpose of and need for the Project. Material to be borrowed for construction of the TSF enclosure embankment left a disturbed area adjacent to the TSF with no wetlands or streams. An alternative was formulated whereby overburden storage at one of the planned OSAs (the Ramona OSA) was significantly reduced and the overburden was placed instead at the construction borrow areas for permanent storage. This alternative allowed a reduction in the size and footprint of the Ramona OSA and avoidance of fill to several streams and some wetland areas. This alternative was judged to be a reasonable alternative but with increased capital and operating costs compared to the proposed Project. The USACE included the modified Ramona OSA as a Project alternative to be evaluated in detail in the Draft EIS (the Modified Project Alternative).

<sup>4</sup> *Mineral reserves* are defined as mineral deposits that are valuable and legally, financially, and technically feasible to extract. Reserves are usually categorized as *proven* or *probable*, depending on the degree of confidence about the accuracy of the disclosed quantity. A feasibility study is necessary to demonstrate the economic viability of extracting the mineral deposits.

## Question 5 – What environmental issues were considered in the EIS and how were they selected?

The USACE and its cooperating agencies implemented an extensive public involvement program that included public notices, public meetings and a Project-specific website (<http://www.hailegoldmineeis.com>) to assist with the identification of issues to be considered in the Draft EIS. The public scoping process identified impact issues for consideration in the Draft EIS in the following resource categories:

- |  |                                   |
|--|-----------------------------------|
| ▪ Geology and soils                              | ▪ Land use                        |
| ▪ Groundwater and water quality                  | ▪ Transportation                  |
| ▪ Surface water and water quality                | ▪ Cultural resources              |
| ▪ Water supply and floodplains                   | ▪ Visual resources and aesthetics |
| ▪ Wetlands and other waters of the United States | ▪ Recreation resources            |
| ▪ Aquatic resources                              | ▪ Air quality                     |
| ▪ Terrestrial resources                          | ▪ Noise and vibration             |
| ▪ Federally listed species                       | ▪ Health and safety               |
| ▪ Socioeconomics and environmental justice       | ▪ Hazardous materials and waste   |

### Further Information:

NEPA requires the analysis of potential direct and indirect impacts on various elements of the human and natural environment. The CEQ guidelines provide categories of impacts to be considered, but all categories may not pertain to all projects. A preliminary understanding of the project and the environmental conditions in the area where the project is to occur is needed to determine the scope of analysis to be considered in an EIS. If there is no indication that the project would affect an environmental resource, the EIS does not need to include an analysis of impacts on that resource. In addition, the USACE is required to conduct a “public interest review.” The public interest review involves more than a review of impacts on Waters of the U.S. The decision of whether to issue a DA permit is based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest. Evaluation of the probable impacts of a proposed activity on the public interest requires a careful weighing of all those factors that become relevant in a particular case. The benefits that reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detrimental impacts. The decision of whether to authorize a proposed project is determined by the outcome of this balancing process. Environmental resources considered in the Draft EIS include geology and soils, groundwater and surface water hydrology and water quality, water supply and floodplain management, wetlands and Waters of the U.S., aquatic and terrestrial resources, federally listed species, socioeconomics and environmental justice, land use, transportation, cultural resources, visual resources and aesthetics, recreation, air quality, noise and vibration, health and safety, and hazardous materials and waste.

Table ES-2 shows the categories of environmental resources and key impact issues that were included in the scope of the EIS as a result of the USACE’s initial review and the public scoping process.



**Table ES-2 Environmental Resources and Impacts Considered in the EIS**

Environmental Resource Category	Potential Impacts
Geology and soils	<p>Potential loss of soils and surface materials from excavation and from construction of facilities, including roads, the tailings storage facility, and overburden storage areas.</p> <p>Erosion of soils and surface materials from Project activities and associated changes to slopes and drainage patterns at the site.</p> <p>Long-term changes in soil type and cover across the Project area from changes in the landscape.</p> <p>Removal of subsurface geological resources.</p>
Groundwater and water quality	<p>Reduced availability of groundwater supply as an important contributor to surface hydrology.</p> <p>Changes in groundwater chemistry and water quality by leaching of mined areas and backfill material.</p>
Surface water and water quality	<p>Watershed alterations from channel modifications and rerouting.</p> <p>Changes in surface water chemistry and water quality from land disturbance activities and modified water withdrawals and discharges including stormwater.</p> <p>Reduced availability of groundwater contributions to surface waters from lowering the groundwater levels.</p>
Water supply and floodplains	<p>Reduced availability of water resources for agricultural, domestic, industrial and commercial, and public water supply uses.</p> <p>Potential floodplain encroachment and inundation from watershed alterations and modification of runoff rates and concentrations.</p>
Federally listed species	<p>Potential impacts on species listed as Threatened, Endangered, or Candidate by the U.S. Fish and Wildlife Service under the Endangered Species Act.</p>
Socioeconomics and environmental justice	<p>Potential economic benefits from gold production and its associated market value.</p> <p>Potential economic benefits from project-level investment and spending in the local economy as the mine is developed, operated, and reclaimed.</p> <p>Employment opportunities at the mine and wages paid to the local workforce.</p> <p>Regional economic benefits that extend beyond the mine as local expenditures and labor income ripple throughout the economy based on linkages among industries and households.</p> <p>Increased demands for public services and local infrastructure.</p> <p>Potential for disproportionate impacts on environmental justice populations.</p>
Land use	<p>Changes in land use and land ownership.</p> <p>Consistency with local zoning ordinances.</p> <p>Potential impacts on prime and unique farmlands.</p>
Transportation	<p>Potential traffic congestion on roadways and intersections in the Project vicinity.</p> <p>Potential additional wear and tear on roadway surfaces, causing potholes or other damage.</p> <p>Potential vehicle conflicts or collisions at proposed new access points.</p>
Cultural resources	<p>Disturbance or impacts to cultural (historical and archaeological) sites.</p>

**Table ES-2 Environmental Resources and Impacts Considered in the EIS (Continued)**

Environmental Resource Category	Potential Impacts
Visual resources and aesthetics	Changes in visual character of the study area in the short term during construction and operation. Changes in visual character of the study area in the long term after reclamation.
Recreation resources	Impaired access to recreational areas. Degraded recreational fishing and hunting opportunities. Potential conflicts with adopted recreation plans or policies.
Air quality	Potential to generate direct emissions of criteria pollutants, hazardous air pollutants, and greenhouse gases through the use of on-road vehicles, off-road equipment, and stationary equipment for exploration, development, construction, operations, maintenance, and reclamation of the mine. Compliance with the National Ambient Air Quality Standards.
Noise and vibration	Generation of noise through the use of on-road vehicles, off-road equipment, and stationary equipment during exploration, development, construction, operation, maintenance, and reclamation of the Project. Generation of ground-borne vibrations from the use of on-road, off-road, mobile, and stationary equipment and from blasting activity during exploration, development, construction, operations, maintenance, and reclamation of the Project.
Health and safety	Potential impacts of natural hazards to project facilities. Potential health and safety risks to workers at the Project site. Ability of the community's capacity to provide emergency response.
Hazardous materials and waste	Potential risks of handling, transportation, and storage of potentially hazardous materials and waste.

In addition to the evaluation of direct and indirect impacts on specific resources, an analysis of the cumulative effects of past, present, and reasonably foreseeable future actions was undertaken. This analysis considered the potential for additional mining in the Carolina Slate Belt, other industrial and conservation projects that could occur in the region, and the potential that transportation projects could bring new growth to the region. The potential effects of other regional growth trends and specific projects, to the extent that they could be identified and quantified, were added to the projected effects of the Haile Gold Mine Project to determine the magnitude and extent of any cumulative effects.

## **Question 6 – How were potential environmental impacts of the project analyzed?**

Potential environmental impacts were analyzed for each of the issues listed by environmental resource category in Table ES-2. For each resource category, a relevant study area was defined (the Project area within the Project boundary or some region beyond, depending on the nature of the potential effects), and the existing environmental conditions were described. In most cases, this involved collecting existing environmental data. For some resources, such as groundwater, empirical data were used in conjunction with computer models to estimate existing conditions. Environmental impacts were identified by comparing the Applicant's Proposed Project and the Modified Project Alternative to the No Action Alternative, and to each other.

The anticipated environmental effects of the proposed Project and each of the alternatives were analyzed for each of the identified environmental resources. The interrelated effects for several of the resources—such as groundwater, surface water and wetlands, for example—were considered during the impact analysis.

### **Question 7 – Were mitigation measures included in the environmental analysis?**

The Applicant has committed to a number of measures to minimize environmental impacts from the proposed Project in the event that the DA permit is granted. These measures are outlined in the Applicant's revised DA permit application, Monitoring and Management Plan, Compensatory Mitigation Plan, and Reclamation Plan (these plans are included as appendices to the Draft EIS). These measures are summarized by resource section in Chapter 4, "Environmental Consequences." The complete list of measures is included in Chapter 6, "Mitigation and Monitoring." Because Haile has committed to these measures, the impact analysis in the EIS assumed their implementation.

### **Question 8 – How were the effects of groundwater drawdown analyzed?**

Effects on surface water and groundwater quantity and quality were analyzed through computer models based on historical and newly acquired hydrogeologic field data.

#### **Further Information:**

To analyze the potential effects of groundwater pumping prior to and during mining, a computer-based groundwater model was developed (based on the widely used MODFLOW groundwater model) using data from a series of groundwater wells installed in the vicinity of the Project. The model predicted changes in groundwater levels and flow paths after groundwater drawdown (also referred to as *depressurization*), and predicted the effects of surface water flows during the mining period and the likely recovery of surface water in the post-mining period. The groundwater model also was used to simulate refilling of Ledbetter Pit Lake, to simulate post-mining groundwater flow paths, and to provide input to further the analysis of water quality impacts.

As expected, the groundwater modeling analysis predicted lowering of the groundwater elevation (drawdown) in and around the mining pits. The greatest drawdown would occur in the vicinity of the pits and would decrease with distance from the center of pumping, depending on site geology (the type of rock and its permeability). The maximum extent of drawdown is shown to be 3 miles north of the center of pumping (at the pit edge); at this furthest horizontal extent, the groundwater level is expected to drop by 1 foot or less. The lowering of groundwater elevations would affect surface waters by lowering the baseflow contribution to streams and changing hydrologic conditions in wetlands.

### **Question 9 – What mitigation is proposed for impacts on water users from groundwater drawdown?**

Based on the SCDHEC water resources inventory, public water distribution systems are available to users in the Project vicinity, and no properties within a 2-mile radius of the proposed Project boundary (within the area of lowered groundwater elevations) rely on local groundwater wells for drinking water. In the event that wells, ponds, or springs used for water supplies are affected by Project activities, Haile would be required to provide alternative water supplies.

**Further Information:**

The environmental analysis predicts that groundwater pumping would drawdown groundwater in the area of the mining pits and in an area extending outward from the pits. The SCDHEC conducted a water resource inventor to identify water users in the vicinity of the proposed Project that could be affected by this lowering of groundwater levels. Anticipating the potential for these impacts to occur, Haile has committed to monitoring a group of strategically located wells in order to record changes in groundwater levels and changes in water quality. The SCDHEC Mine Operating permit would include conditions to ensure that water supply complaints are investigated by a third-party contractor. Where it is substantiated that these effects are caused by the mine depressurization, mitigation would be required. Potential mitigation includes connecting affected users to an available potable water supply, re-working the well, or providing a new well.

**Question 10 – How would the Project affect wetlands and streams and how would impacts be mitigated?**

The proposed Project would directly affect approximately 120.46 acres of wetlands and open waters and 26,460.54 linear feet of streams through excavation of pits and placement of fill material. Indirect effects resulting from lowered groundwater levels would result in impacts on 982.58 acres of wetlands where groundwater drawdown in excess of 1 foot would occur for sustained durations during both the active mining and post-mining periods. The Applicant proposes to offset these losses via a permittee-responsible compensatory mitigation plan.

**Further Information:**

Dredge and fill activities for construction of the mining pits, OSAs, Mill facilities, TSF, and haul roads would result in direct losses of wetlands and streams. The depressurization (drawdown) of groundwater in order to excavate the mine pits would result in indirect impacts on wetlands and streams through the loss of hydrology. These impacts are summarized in Table ES-3.

The wetlands in the Project area primarily consist of slope wetlands that are groundwater driven. Consequently, pumping groundwater for pit dewatering would lower the groundwater elevation and reduce baseflows in both the groundwater and in surface streams. This in turn would result in impacts on wetland systems and any receiving waterbodies (streams).

Considerable indirect impacts on Waters of the U.S. are expected to occur from alterations in hydrology and related changes in water quality, including changes in water temperature and alterations to wetlands and riparian (streamside) habitat. Project-related activities that alter hydrology to the extent that wetlands are no longer inundated or saturated sufficiently to support wetland vegetation would result in partial or permanent loss of wetland resources.

The extent of impacts associated with hydrologic changes to a given wetland or stream depends on baseline conditions (e.g., hydrologic regimes, wetland types, soils, and geology), proximity to dewatering activities, and the duration of dewatering activities. Depending on the extent and duration of impacts, hydrologic changes are expected to result in temporal or permanent losses of wetlands and streams and/or their functions. When depressurization activities cease, the water table is expected to recover to approaching pre-mining conditions, and some wetland and stream functions are expected to re-establish. Likewise, indirect impacts associated with water quality and thermal impacts may not result in a permanent loss of wetlands and streams but would contribute to functional losses in habitat types. Therefore, the impact analysis considered the degree and duration of impacts to allow for accurate assessment of the total functional loss.

To compensate for impacts on Waters of the U. S., Haile has proposed a permittee-responsible compensatory mitigation plan to ensure long-term protection of three ecologically significant properties totaling 4,388.8 acres – Goodwill Plantation and Cooks Mountain in the Wateree River watershed and Rainbow Ranch in the Lynches River watershed. The proposed plan includes an endowment of \$9.4 million to the South Carolina Department of Natural Resources Heritage Trust Program, divided into \$4.5 million for maintenance and management of the mitigation sites and \$4.9 million for projects benefiting the Carolina heelsplitter mussel (*Lasmigona decorata*). The plan proposes to convey ownership of the three properties to the Heritage Trust Program to be protected in perpetuity for the benefit of present and future generations. The proposed endowment for long-term management is an outstanding financial trust that would allow the Heritage Trust Program to manage the properties in a holistic, ecological manner and provide ample opportunities over the long term to restore and enhance wetlands and streams on all three tracts. Resources present at the proposed compensatory mitigation sites are presented in Table ES-3.

**Table ES-3 Aquatic Features and Acreages of Applicant's Proposed Mitigation Sites**

Site	Total Site Acreage	Streams (linear feet)	Wateree River Shoreline <sup>a</sup> (linear feet)	Wetlands (acres)
Rainbow Ranch	698.0	19,714	-	28.1
Cooks Mountain	1,131.8	28,292	10,289	485.1
Goodwill Plantation	2,559.0	30,706	29,560	1,048.1
<b>Total</b>	<b>4,388.8</b>	<b>78,712</b>	<b>39,849</b>	<b>1,561.3</b>

<sup>a</sup> West bank of the Wateree River shoreline only.

## Question 11 – What is the effect of the Project on the local economy?

Development and operation of the Haile Gold Mine, including spending by Haile, would increase economic activity in the immediate four-county area surrounding the Project and throughout the state. This includes direct jobs at the mine and jobs created through increased spending in the region. It also includes non-labor spending and tax revenue.

### Further Information:

Total Project spending by Haile during development and active mining is projected to be \$1.1 billion. This includes \$822 million for land, equipment, materials, and goods and services and \$284 million for labor. Of the total spending by Haile, approximately \$572–\$776 million would be spent within the four-county area centered on the Project site. Direct employment at the mine would range from 280 employees in Mine Year 1 to a high of 420 employees in Mine Year 7, with an annual average of 270 employees over the active mining period. This translates into an average of \$17.1 million in annual wages during the 15-year development and active mining phase of the Project. Spending by Haile employees and spending by Haile for non-direct labor expenses is expected to generate additional employment. In the four-county area, this is expected to average from 100 to 270 jobs annually; within the state, it is expected to average from 120 to 310 jobs annually. The total wage income associated with these jobs is estimated at approximately \$139.5 to \$259.7 million.

Spending in the state and in the four-county area would generate property taxes/fees, sales tax revenues, and state income tax revenues. State income tax would be the largest of these revenues; they are projected

to total approximately \$35 million over the active mining period. Sales tax revenues are estimated to be approximately \$1.4 million, and property taxes and fees are estimated to be approximately \$1.1 million. Property taxes and fees and a portion of the sales taxes would accrue directly to Lancaster County, the location of the proposed Project.

The Project may also affect local population levels through increased employment, which in turn would affect the demand for housing resources and public services. Housing resources also may be affected by potential impacts on property values in the region, which would be influenced by both the economic growth anticipated with the Project and proximity to the proposed mining activity. The impact analysis also considered the displacement of existing potential economic uses of Project lands (silviculture) by mine development. Finally, the economic effects on select demographic groups were evaluated in the context of environmental justice.

## **Question 12 – Are there other impacts of the proposed Project and the alternatives?**

In addition to the impacts on groundwater, surface water, wetlands, streams, and the regional economy that are described above, impacts were assessed for each of the other environmental resources identified in Table ES-2. For each resource, impacts were evaluated under the No Action Alternative, the Applicant's Proposed Project, and the Modified Project Alternative.

### **Further Information:**

A general summary of the potential impacts by resource category is provided in Chapter 2, "Project Description and Alternatives." The table includes impacts associated with the No Action Alternative, the Applicant's Proposed Project, and the Modified Project Alternative. More detailed discussions of the analysis of impacts for each alternative are contained in Chapter 4, "Environmental Consequences." Impacts were determined by comparing the Applicant's Proposed Project and the Modified Project Alternative to the No Action Alternative, and to each other.

## **Question 13 – What will happen at the mine when mining is finished?**

After completion of mining and processing, the site would be reclaimed in accordance with an SCDHEC-approved reclamation and closure plan. Then the site would be monitored under a monitoring and management plan also approved by the SCDHEC. All of the buildings and processing equipment would be removed. OSAs would be contoured and revegetated, and those pits not refilled with overburden would be allowed to fill with water, ultimately forming lakes. Johnny's PAG and the TSF would be capped with a closure system that would prevent acid mine drainage from being released into the environment.

### **Further Information:**

To provide for the long-term protection of land and water resources, minimize the adverse impacts of mining, and support the potential post-mining land use, Haile would close and reclaim the mine site. Mine closure and reclamation would be conducted in accordance with a state-approved reclamation plan developed to comply with Section 48-20-90 of the South Carolina Mining Act. Haile's proposed Reclamation Plan is included as Appendix H of the Draft EIS. Following reclamation, the Project area would be monitored into the future to ensure the long-term success of the Reclamation Plan. Long-term monitoring would comply with a State-approved Monitoring and Management Plan (Appendix G of the

Draft EIS contains the Applicant's proposed Monitoring and Management Plan) and the individual monitoring requirements set forth in any permits issued to Haile.

Land disturbed by mining, ore processing operations, and tailings/overburden storage at the proposed Haile Gold Mine would generally be reclaimed to pre-Project conditions, to the extent practical. The Mill and most other buildings and other facilities—except those required during the closure and post-closure monitoring period—would be removed, and the areas would be graded and revegetated. The TSF and the area for storing PAG overburden would be capped with a barrier to isolate the materials stored in these facilities from the environment. All OSAs would be covered with topsoil and revegetated. All of these facilities would be monitored after closure to ensure that the slopes do not unduly erode, causing sedimentation in local streams, and that the vegetation cover is maintained.

Several of the mining pits would be refilled with overburden. Others would be allowed to fill with water and over a period of time would become lakes. The water quality in these lakes would be monitored as they fill to ensure that they are within acceptable standards.

After reclamation and closure, the site may be suitable for other future land uses. The Duckwood TSF and Johnny's PAG would need to be maintained in an undisturbed condition for perpetuity to protect and maintain the integrity of the closure systems. Other areas of the remaining property may be suitable for uses such as recreation, agriculture, or more intense land development (e.g., industrial, office, or residential development) because utility infrastructure would be available. Designated or targeted future uses for the mine site are identified in the Reclamation Plan.

## **Question 14 – What are the next steps in the process and how will the public be involved?**

The publication of this Draft EIS is an important element of the public involvement process. Public availability initiates a comment period, during which time members of the public, agencies and tribes are invited to review and provide comments on the Draft EIS. Comments may be provided in written form or may be submitted verbally during a scheduled public hearing. Following receipt of public input on the Draft EIS during the comment period, all comments will be considered in preparing a Final EIS.

### **Further Information:**

The Draft EIS has been made available to all interested individuals, government agencies, tribal members, and members of non-governmental organizations who have indicated an interest in the Project for review and comment. The USACE has developed and maintains a mailing list through the public involvement process that includes attendees at public meetings, commenters during the scoping process, and individuals who have logged onto the public Project website maintained by the USACE.

Following closure of the comment period and after reviewing and responding to all comments received, the USACE will prepare and issue a Final EIS. This document will include the Draft EIS and its appendices, as revised in response to the comments received. It also will include a listing of the comments received and the responses to those comments.

When completed, the USACE will provide a Notice of Availability published in the Federal Register and a local public notice announcing that the Final EIS is publicly available. These notices will be issued to all who have placed their names on the Project mailing list or who have commented on the Draft EIS. The Final EIS also will be issued in electronic format through the public Project website (<http://www.hailegoldmineeis.com>). The public will be given a minimum of 30 days to comment on the Final EIS.



## **Question 15 – Who decides if the Project can be implemented?**

On behalf of the Secretary of the Army, the District Engineer for the Charleston District is responsible for making the federal permit decision on Haile's application for placement of dredged and fill material into Waters of the U.S. (wetlands and streams) during development, operations, and closure of the Haile Gold Mine. Officials at the SCDHEC have state regulatory authority for additional permit decisions that are necessary for Haile to implement the proposed Project.

### **Further Information:**

Completion of the Final EIS does not constitute approval of the Project. The Final EIS provides required information about the potential environmental effects of the Project. The USACE will consider this information when determining whether a DA permit should be issued and, if so, what specific conditions should be included in the permit. The USACE would issue a permit through the authority delegated to the USACE by the CWA. The USACE will prepare and make available to the public, a Record of Decision summarizing the permit application, the USACE'S review of the application, and other pertinent information such as the Final EIS and its findings regarding Section 404(b)(1) of the CWA.

A DA permit would only authorize Haile to place dredge and fill material in streams and wetlands in the Project boundary. Other mining-specific activities such as excavating overburden, processing ore, and treating process water, would require additional permit authorizations from other agencies. A list of permit requirements is provided in Chapter 1, "Project Background and Purpose and Need," and in Appendix F, "Laws, Policies, and Plans Applicable to the Haile Gold Mine Project."

## **Question 16 – Where can I find more information about the Project?**

The USACE maintains a publicly accessible website at <http://www.hailegoldmineeis.com> devoted to this Project. The website contains an outline of the process for preparing the EIS, pertinent documents referenced within this Draft EIS, and information about the public's opportunity to participate in preparation of the EIS. In addition, the USACE has developed an interactive web simulation designed to help familiarize users with the proposed Project and its associated impacts. The simulation is called the Mine Interactive Experience (MInE) and can be accessed at the following web address: <http://www.hailegoldmineeis.com/interactive-map/index.html>.

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## List of Acronyms

µg	microgram
µg/L	micrograms per liter
µg/m <sup>3</sup>	micrograms per cubic meter
µm	micrometer(s)
2CaOCl	bleach powder
404(b)(1) guidelines	Section 404 (b)(1) guidelines

### –A–

ABS	ammonium bisulfite
ACHP	Advisory Council on Historic Preservation
AERMOD	AERMOD modeling system
ALUS	aquatic life use support
AMEC	AMEC Earth and Environmental, Inc.
amsl	above mean sea level
APC	aerobic polishing cell
Applicant	Haile Gold Mine, Inc.
APT	aquifer performance test
AQCR	Air Quality Control Region
ARM	Ambient Ratio Method

### –B–

bgs	below ground surface
BI	Biotic Index
BMP	best management practice
BMW	baseline monitoring well
BOD <sub>5</sub>	5-day biological oxygen demand

### –C–

c.	circa
°C	Centigrade
CAA	Clean Air Act
CaCO <sub>3</sub>	calcium carbonate
Ca-HCO <sub>3</sub>	calcium bicarbonate
Ca-Mg-HCO <sub>3</sub>	calcium-magnesium bicarbonate

Ca-SO <sub>4</sub>	calcium sulfate
CaF <sub>2</sub>	calcium fluoride
CAM	compliance assurance monitoring
CaO	calcium oxide (quicklime or pebble lime)
CCC	criterion continuous concentration
Central Electric	Central Electric Power Cooperative
CEQ	Council on Environmental Quality
CEQ Regulations	<i>Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act</i>
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH <sub>4</sub>	methane
CIL	carbon-in-leach
CIM	Canadian Institute of Mining, Metallurgy, and Petroleum
CMC	criterion maximum concentration
cm/s	centimeter(s) per second
CN-	cyanide anion
CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> -e	CO <sub>2</sub> -equivalent
Code, the	International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold
Cowardin classification system	Classification of Wetlands and Deepwater Habitats of the United States
CPOM	coarse particulate organic matter
CPS	Coastal Plain Sand
CRWTF	Catawba River Water Treatment Facility
CS <sub>2</sub>	carbon disulfide
CSAPR	Cross-State Air Pollution Rule
CT	census tract
CuSO <sub>4</sub>	copper sulfate
CWA	Clean Water Act
cy	cubic yard(s)

## —D—

DA	Department of the Army
dB	decibel
dBA	A-weighted decibel scale
dbh	diameter at breast height
DFIRM	Digital Flood Insurance Rate Maps



**–E–**

EFH	essential fish habitat
eGRID	Emission & Generation Resource Integrated Database
EIS	Environmental Impact Statement
EMS	emergency medical services
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
EPT	Ephemeroptera/Plecoptera/Trichoptera
ERAP	Emergency Response Action Plan
ERC	Ecological Resource Consultants, Inc.
ESA	Endangered Species Act

**–F–**

°F	Fahrenheit
FAC	facultative
FACW	facultative wetland
FDCP	Fugitive Dust Control Plan
Feasibility Study	<i>Haile Gold Mine Project NI 43-101 Technical Report, Feasibility Study</i>
FEMA	Federal Emergency Management Agency
FeS <sub>2</sub>	iron sulfide
FILOT	fee-in-lieu-of-taxes
FMC	Fishery Management Council
FR	Federal Register
FTA	Federal Transit Administration
ft/sec	foot (feet) per second
FW	freshwater
FY	fiscal year

**–G–**

G&A	general administrative
GACT	generally achievable control technology
GDP	gross domestic product
GHG	greenhouse gas
GHG Reporting Rule	<i>Fact Sheet for Final Rule: 2013 Revisions to the Greenhouse Gas Reporting Rule and Confidentiality Determinations for New or Substantially Revised Data Elements</i>
gpm	gallons per minute
GWP	global warming potential

**—H—**

H <sub>2</sub> SO <sub>4</sub>	sulfuric acid
Haile	Haile Gold Mine, Inc.
HAP	hazardous air pollutant
HCl	hydrochloric acid
HCN	hydrogen cyanide
HDPE	high-density polyethylene
HF	hydrogen fluoride
HFC	hydrofluorocarbon
Hg	mercury
HGM classification system	Hydrogeomorphic Classification of Wetlands
HGM	hydrogeomorphic assessment
HNO <sub>3</sub>	nitric acid
HUC	Hydrologic Unit Code
Hz	Hertz

**—I—**

I-	Interstate
ICMM	International Council on Mining and Metals
ICOLD	International Commission of Large Dams
IMPLAN	Impact Analysis for PLANning
Interim Regional Supplement	<i>Interim Regional Supplement to Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region</i>
I-O	input-output
IPCC	Intergovernmental Panel on Climate Change

**—J—**

JD	judicial determination
JPN	Joint Public Notice

**—K—**

km	kilometer(s)
KNO <sub>3</sub>	Potassium nitrate
KOP	key observation point
kV	kilovolt
kW	kilowatt

**-L-**

L <sub>DN</sub>	day-night sound level
LCRS	leak collection and recovery system
LCW&SD	Lancaster County Water and Sewer District
LEDPA	least damaging practicable alternative
LF	linear feet
L <sub>EQ</sub> (24)	a sound level averaged over a 24-hour period
LLDPE	linear low-density polyethylene
LOS	level of service
LRREC	Lynches River Rural Electric Cooperative

**-M-**

m <sup>3</sup>	cubic meter(s)
MACT	maximum achievable control technology
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
mg	milligram(s)
mg/kg	milligrams per kilogram
mg/L	milligram(s) per liter
mgd	million gallons per day
mgm	million gallons per month
Mg-SO <sub>4</sub>	magnesium sulfate
mil	millimeter
Mine Act, the	Mine Safety and Health Act of 1977
MinE	the Mine Interactive Experience
Mitigation Rule	Compensatory Mitigation for Losses of Aquatic Resources, Final Rule
mm	millimeter(s)
MMP	Monitoring and Management Plan
MOA	Memorandum of Agreement
mph	miles per hour
MRL	minimum reporting limit
MSDS	material safety data sheet
MSHA	Mine Safety and Health Administration
msl	mean sea level
MW	megawatt(s)

**-N-**

N	nitrate
N <sub>2</sub> O	nitrous oxide
Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub>	borax glass
Na <sub>2</sub> CO <sub>3</sub>	sodium carbonate
NAAQS	National Ambient Air Quality Standards
NaCN	sodium cyanide
Na-HCO <sub>3</sub>	sodium bicarbonate
NaOH	sodium hydroxide
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFIP	National Flood Insurance Program
NGO	non-governmental organization
NHPA	National Historic Preservation Act
NHPA	National Historic Preservation Act
NI	National Instrument
NIHL	noise-induced hearing loss
NMFS	National Marine Fisheries Service
NO <sub>2</sub>	nitrogen dioxide
NOI	Notice of Intent
Non RPW	seasonal RPW
NO <sub>x</sub>	nitrogen dioxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NSR	New Source Review
NTU	nephelometric turbidity unit
NWI	USFWS National Wetland Inventory
NWR	national wildlife refuge

**-O-**

O <sub>3</sub>	ozone
OBL	obligate
OPA	Oil Pollution Act
opt	ounces per ton
OSA	overburden storage area

**–P–**

PAG	potentially acid-generating
PAX	potassium amyl xanthate
Pb	lead
PbNO <sub>3</sub>	lead nitrate
PbO	litharge
PEM	palustrine emergent wetland
PFC	perfluorocarbon
PFO	palustrine forested wetlands
pH	acidity
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIAG	Public Involvement Advisory Group
Piedmont	Piedmont Mining Company
PL	Public Law
PM <sub>10</sub>	particulate matter with a diameter greater than 2.5 µm and less than approximately 10 µm
PM <sub>2.5</sub>	particulate matter with a diameter of 2.5 µm or less
PMP	probable maximum precipitation
PO <sub>4</sub>	orthophosphate
POW	palustrine open water
ppm	parts per million
ppt	parts per thousand
PPV	point peak velocity
Preserve	Forty Acre Rock Heritage Preserve and Wildlife Management Area
proposed Project or Project	Haile Gold Mine Project
PSD	Prevention of Significant Deterioration
psi	pound(s) per square inch
PSS	palustrine scrub-shrub

**–Q–**

<i>Q.</i>	<i>Quercus</i> (oak species)
-----------	------------------------------

**–R–**

R2	lower perennial
R3	upper perennial
R4	intermittent
R-45A	Rural Residential Intense Agricultural
RCRA	Resource Conservation and Recovery Act

RFFA	reasonably foreseeable future action
ROD	Record of Decision
Romarco	Romarco Minerals, Inc.
RPW	relatively permanent water
RUS	Rural Utilities Service

## –S–

SCDAH	South Carolina Department of Archives and History
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCDOR	South Carolina Department of Revenue
SCDOT	South Carolina Department of Transportation
SCDPRT	South Carolina Department of Parks, Recreation and Tourism
SCFC	South Carolina Forestry Commission
SCIAA	South Carolina Institute of Archaeology and Anthropology
SCM	site conceptual model
SCMA	South Carolina Mining Act
SCORP	South Carolina's 2008 <i>State Comprehensive Outdoor Recreation Plan</i>
SCPCA	South Carolina Pollution Control Act
SCMA	South Carolina Mining Act
SDWA	Safe Drinking Water Act
SELC	Southern Environmental Law Center
SF <sub>6</sub>	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SiO <sub>2</sub>	silica
SIP	State Implementation Plan
SO <sub>2</sub>	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
sp.	species
spp.	species (plural)
SR	State Road or State Route
SRBR	sulfate-reducing bioreactors
STAR Team	Specialized Training and Response Team
STIP	South Carolina Statewide Transportation Implementation Program
STS	South Technical Services, LLC
s.u.	standard unit
SWAT	special weapons and tactics

SWPPP	Stormwater Pollution Prevention Plan
SWS	Schlumberger Water Services

## **-T-**

TAP	toxic air pollutant
TCP	Traditional Cultural Property
TDS	total dissolved solids
TEC	threatened, endangered, and candidate
THPO	Tribal Historic Preservation Officer
Thread, the	Carolina Thread Trail
TIS, the	<i>Highway 601 &amp; Haile Gold Mine Road Traffic Impact Study</i>
TMDL	total daily maximum load
TN	total nitrogen
TNW	traditional navigable water
tpy	tons per year
TSF	tailings storage facility
TSS	total suspended solids
TSX	Toronto Stock Exchange

## **-U-**

UDO	Unified Development Ordinance
UNFCCC	United Nations Framework Convention on Climate Change
U.S.	United States
US 601	US Highway 601
USACE	U.S. Army Corps of Engineers, Charleston District
USBM	U.S. Bureau of Mines
USC	U.S. Code
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UV	ultraviolet

## **-V-**

VdB	vibration decibels
VOC	volatile organic compound
VWP	vibrating wire piezometer

**–W–**

WAD

weak acid dissociable

Waters of the U.S.

other Waters of the United States

Wetland Delineation Manual

*Corps of Engineers Wetland Delineation Manual*



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